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The invention relates to a method to the flotation of disturb-open from an aqueous fibrous material suspension in accordance with the preamble of Claim 1.

Method of the mentioned type will used, in order to separate from an aqueous fibrous material suspension at least a part of the disturbing off particles suspended therein. As well known the fabrics who can be separated a contained froth or swimming mud formed becomes with a flotation. A typical application of a such method is the treatment of out printed waste paper a recovered aqueous fibrous material suspension, detached in which the printing ink particles are already of fibers, so that they can be out-floated. The here described flotation procedure uses the differences between pulp and undesired solid particles in the type that the pulp remains due to its hydrophilicity in the fibrous material suspension, while the addressed solid particles are hydrophobic and arrive therefore together with the air bubbles into the froth. Beside the printing ink particles there is also a variety of other fabrics, who are hydrophobic and let themselves therefore by flotation from the pulp be separated. Such fabrics are in particular adhesives, fine plastic particles and eventual also resins. If by the flotation procedure fibers are to be segregated by contaminants separated, thus not all solid particles, one speaks of selective flotation. The likewise used term "Flotationsdeinking" does not become usually only for the removal of printing ink particles (Inc. = printing ink) but also general for the selective flotation of contaminants from fibrous material suspensions used.

The related art concerning flotation procedures for fibrous material suspensions progressed already very far. Therefore there is solutions, which are quite suitable, a large part of the solid particles by flotation to remove. Since flotation plants are aufwändig relative in the procurement and in the operation, it is an understandable object, to improve whose effect or to reduce the necessary effort for reaching the same result.

A method, with that the addition of the fibrous material suspension into the already formed froth made, is z. B. from the DE 198 23 053 known.

The object is appropriate for the invention to sakes to improve flotation procedures of this type more other. Cleaning result and/or the yield of the method are to become increased.

This object becomes dissolved by the features of the claim 1 to full extent.

Since added with methods of this type the unbelüftete fibrous material suspension becomes into the ascending froth, it meets an already formed Lufblasenverbund with itself between them finding liquid passages. In this way the countercurrent principle becomes realized. D. h. that the "dirtiest" suspension with the already very strong loaded air bubbles comes into contact, on the path continuous clean becomes downward, whereby also the air bubbles less dirt freight inertial found then. This known and anyway already favourable principle becomes thereby substantially improved

that the ascending compressed froth can move away into a range, in which no suspension from above follows. There the Flotationsschaum continues to thicken and is particularly suitable to bind and exhaust the attached breakdown materials. The waste water running off with thickening can become collected and separate withdrawn if necessary.

The invention and its advantages become explained on the basis designs. Show:

Fig. 1 schematic: Execution of the invention process with an open flotation cell;

Fig. 2 schematic: Carrying out the process on the basis a flotation column;

Fig. 3 view from downside on particular supply means;

Fig. 4 + 5 two embodiments of the supply means;

Fig. 6 supply means with flow reversal;

Fig. 7 + 8 two variations in Fig. 6 supply means shown.

In Fig. 1 becomes the flotation procedure on the basis a flotation cell described. By addition of gas G, here by porous tubes 5 in the bottom region of the flotation cell, gas bubbles become 1 formed, from which only few and these exaggerated large drawn are. They ascend from the liquid layer 6 against the lying close gravity field. In principle the lying close gravity field can be the earth gravitation or become in corresponding other embodiments by centrifugal forces strengthened. (In such cases "above" same means "in opposite direction to the field"). The ascended air bubbles collect themselves above the liquid layer 6 in the froth 2. This is still relative aqueous in this place, why the interfaces of the bubbles predominant spherical are formed: One then often speaks of ball foam. Into this froth the fibrous material suspension S introduced from above by supply means 7, which sinks downward then against the climbing direction of the froth 2, becomes. The addition zone 4, in that the fibrous material suspension S with the froth mixed, is indicated by a broken drawn rectangle. The ascending froth 2 so guided becomes according to invention the fact that it does not flow through the addition zone 4 is directed but at this lateral. In addition here an annular channel serves 8, which is for instance on the height of the addition zone 4. Paths of the small liquid content in this way other thickened froth of the 3 the interfaces of the foam blisters have often a polyhedron form, why it becomes also designated as polyhedron foam. The various kinds of foam are in the figs indicated by two various laminar patterns. In the practice there are no sharp boundaries between them separates transition regions. A plate 9 arranged above the addition zone 4 brakes the upward movement of the froth. The thickened froth 3 other led by the annular channel and ' can collect itself above the plate 9 and flow off then or become aspirated.

The invention process offers other advantages in particular embodiments. Thus the Fig shows. 1 in the bottom of the annular channel 8, D. h. thus underneath thickened Flotationsschaumes 3 a waste water sink 11 the led past the addition zone 4. Thus from the thickened Flotationsschaum 3 dropping the waste water can become 13 collected and from the flotation cell derived. For this purpose ring resistance is 10 mounted in this place. Another opportunity, i.e. a rinnenförmige underside of the annular channel shows the Fig. 5. Thus prevented becomes with simple agents that this waste water back-arrives the flotation effect of the method degraded into the flotation area and thus. The waste water 13 knows z. B. separate clarified and then reused or - like late still shown - direct into the flotation cell recycled becomes.

Paths of the large number of the air bubbles the downward directed current divides itself 4 very fine below the addition zone, so that a corresponding large probability exists to the attachment of the breakdown materials to the air bubbles. With this schematic illustration also the supply means are 7 only indicated ones. In a technical apparatus she is to be trained in such a way that one if possible uniform distribution of the admitted fibrous material suspension S made. In addition here several next to each other located pipings punched down are provided. In addition, the supply means can form with the plate 9 a constructive unit, for which the Fig. 4 and 5 examples show. Then it consists of a flat chamber, which is provided down uniform with holes 12 or nozzles (S. Fig. 3). The top wall of this chamber forms the mentioned plate 9.

After made purification the fibrous material suspension collects itself down in the liquid layer 6 and

can become as Gutstoff S' discharged. Between the liquid layer 6 and the froth 2 is an interface, whose form changes by vortex continuous.

The invention process can also in a flotation column, like in Fig. 2 shown, performed become. The entire flotation container becomes a bottom certain excess pressure maintained, so that the thickened contaminated froth 3 is provoked ' over a located above foam pipe as Rejekt R. This Fig. an other variation shows 2, i.e. concerning the supply of the gas bubbles needed to the flotation. A partial flow becomes 14 of the suspension, z in actual known manner. B. down from the liquid layer 6 aspirated, aerated (gas G) and at a location as aerated suspension 15 again supplied, located over it. This variant has the advantage of a particularly good and controllable mixture of the fibrous material suspension with the gas bubbles. As well known the amount of gas and the gas bubble distribution of large influence are on the flotation effect. Beyond that a certain energy must become transferred to be able to deposit in order to out-float the particles to the gas bubbles. Also this requirement can become with such a separate ventilation cycle optimal fulfilled. If the waste water becomes 13 fed into the ventilation cycle (broken line 16), the breakdown materials contained in it can again be floated.

Depending upon requirements at economics and cleanliness the waste water can also into the inlet to the flotation cell (broken line 17) or into the upper part of the liquid layer 6 again added become (broken line 18). If the flotation becomes multistage performed, as the Rejekt flows to R into the subsequent stage, the waste water can become added also here.

During in the Fig. 1 and 2 the plates planar located above the addition zone 4 is, can it be favourable, supply means 7 ' conical (Fig. 4) to implement. An other opportunity shows Fig. 5 with supply means 7 formed as ball portion ". By these or similar slanting longitudinal forms the deflection of the ascending froth upward becomes 8 particularly favored into the annular channel. The waste water, which accumulates on the plate, can become at their deepest location by an other waste water sink 11 'derived or aspirated.

While into the Fig. 1 and 2 supply means shown 7 is provided with pipings punched down, shows the Fig. 6 supply means 7 '"', their pipings 19 upward opened is. Thus the coarse-pumped fibrous material suspension S can withdraw upward and become against the underside of the lid 9 pumped with particular advantage. That leads to a flow reversal with corresponding percussion procedures, whereby a particularly good mixture and distribution of the supplied fibrous material suspension are S possible. Like Fig. the underside of the lid 9 " corrugated shows, can 7 or be provided with pyramidal projections, in order to obtain a particularly favourable division of the fibrous material suspension outgoing from the piping 19. Another opportunity shows Fig. 8 with nietkopfförmigen projections at the underside of the lid 9 '"'. In this way diverted fibrous material suspension flows then at the pipings 19 past downward into the froth 2. Simultaneous one becomes depositing having a horror off at the cover lower surface prevented.